Walther and Angelina Hesse—Early Contributors to Bacteriology

In an unassuming way, they moved agar from the kitchen to the lab, revolutionizing bacteriology

WOLFGANG HESSE
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Walther Hesse was a well-known community health physician in the Kingdom of Saxony, a student of Max von Pettenkofer, the father of hygiene, and of Robert Koch, the father of medical microbiology. His American wife, Fanny Angelina, introduced agar-agar to the new science of microbiology.

The Hesse Family

Walther Hesse, a descendent of a Saxon family from Bischofswerda, was born on 27 December 1846 as the third of 12 children of Friedrich Wilhelm Hesse, the Bezirksarzt, or county physician, of Zittau. Friedrich Wilhelm was the first university-educated physician in the family and had received his doctor of medicine degree from the University of Leipzig in 1842. Two of his forefathers were surgeons, one a military surgeon during the Napoleonic wars and the other a graduate of the Surgico-Medical Academy of Dresden. Hesse's mother came from a cloth-weaving family that owned several looms. Two of the 12 children died in infancy; five sons and five daughters survived. Four of the sons became physicians, and the daughters were sent to a teacher's college to make them independent. Walther's older brother Richard became a successful practicing physician in Brooklyn, N.Y. Walther's younger brother, Friedrich Louis, went to America on a visit, became very impressed by the advanced state of U.S. dentistry, and stayed for 3 years of advanced training. He founded the first university chair of dentistry in Germany, at Leipzig. Brother Georg became a surgeon and the director of a private surgical hospital in Dresden.

Walther received his secondary education in Dresden, where he attended the famous Kreuzschule, a Gymnasium (high school) whose choir was founded in 1216. In 1866 he began the study of medicine at the University of Leipzig and received his doctorate in March 1870 after having publicly defended his thesis on the reaction of the epithelium to acute catarrh of the intestinal tract. In 1867, he volunteered for a 1-year reserve-officer course with the army. As a Feldassistenzarzt (second lieutenant of the medical corps) in the Saxon army, he participated in the Franco-Prussian War from 1870 to 1871 and in the battles of Gravelotte and St. Privat.

Right after the war, at age 25, Walther wrote a paper on the situation of military physicians that addressed the combatant status of front troop surgeons and proposed a new position for them. He also criticized the food and water supply system, the shortage of medical personnel, and the absence of transport and field stations for the wounded and offered some advice about effective first aid. This paper—never published—is the first of his postgraduate professional manuscripts. It not only demonstrates his concept of the physician as a socially engaged altruist but also signals the direction of his future professional life.

The remainder of his active military service (until 1873) was spent as a staff physician of the private insane asylum run by Dr. Lehmann in Pirna near Dresden. During this period Hesse also served as a ship surgeon of a German passenger liner on two

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round-trips to New York (November 1872 to February 1873). Upon his return, he published a paper about sea sickness that Professor Gavingel from Le Havre called the first rational, scientific publication on the subject. At home, he was recognized by the medical society of Zittau for his interesting observations and contributions. (The trichinosis he had acquired during his travels healed without residual problems.)

The Eilshemius Family

While Walther visited New York, his brother Richard apparently introduced him to the Eilshemius family, including Fanny Angelina, whom he soon married.

Fanny Angelina was born on 22 June 1850 in New York, the daughter of an import merchant, Henry (Hinrich) Gottfried Eilshemius, and his wife, Cécile Elise. The Eilshemius family was of Dutch descent and originated near Emden, Frisia. Hinrich Gottfried, Fanny Angelina's father, emigrated to the United States in 1842 at age 24. He first settled in Hoboken, N.J., and in 1849 married Cécile Elise Robert, who came from a French-Swiss family in Lugano. They had 10 children; 5 died in their early years, and Fanny Angelina was the oldest. Hinrich, now Henry, was a successful importer of goods and was able to retire in his forties. In 1860 he bought a 70-acre property, Laurel Hill Manor in North Arlington, N.J., near Kearny on the Passaic River. Here Fanny Angelina and her siblings grew up, and the girls learned from their mother and the servants the basics of housekeeping and cooking. When Angelina was 15, her parents sent her to a finishing school in Switzerland to study home economics and French.

Lina Hesse

After the Civil War it was common for rich Americans to spend the summer in Europe. In 1872, the Eilshemius family visited Switzerland, and Fanny Angelina and her sister, Eugénie, went on to Germany and to Dresden, where they met again with Walther Hesse. Dresden, the capital of Saxony, was a major attraction with its buildings, museums, galleries, and opera and was called Florence on the Elbe River. In the next summer, Walther Hesse and Angelina Eilshemius were engaged, and the wedding took place in Geneva on 16 May 1874.

Walther and Angelina Hesse in Saxony

Walther Hesse practiced medicine in Zittau, where their first son (the author's father, Friedrich Henry, later a surgeon in Dresden) was born in 1875. In 1877 Walther was appointed Bezirksarzt (county physician) in Schwarzenberg im Erzgebirge (mountains between Saxony and Czechoslovakia), a major mining area and, more recently, infamously known because of the bad working conditions in the uranium mines of the former German Democratic Republic. He spent more than 10 years there and was responsible for 83 villages. He visited these villages regularly by horse and buggy and occasionally also on foot.

His main responsibility was the care of sick miners who suffered from Bergkrankheit (mountain disease), later recognized as lung cancer and also known as Schneeberger Lungenkrebs (lung cancer of Schneeberg). After some preliminary studies, Walther published a comprehensive, widely accepted paper about this malignant miners' disease. Arsenic was considered the cause of the cancer at that time, as radioactive substances like uranium and radium had not been discovered yet. Minerals from the nearby St. Joachimtal/Jáchymov mines later became the source of Marie Curie's radium.

Aside from the medical problems of the miners, Walther also concerned himself with the miserable working conditions in the mines and the substandard housing of the miners. He made numerous recommendations to the government to improve the miners' conditions, including the protection of the very young workers, as child labor was common at that time. Again his findings were published in a number of articles.

To increase his knowledge of environmental hygiene, Walther went to Munich to study with the first chairman of a university department of hygiene, Max von Pettenkofer, in 1878 to 1879. With this experience, Walther worked for many years on the hygienic and public health aspects of the human environment and published numerous articles. His primary interest was air quality, especially carbon dioxide content and dust contamination. The experiences in the mining villages turned his attention to the hygiene of habitations and schools, an interest that remained with him to his old age. His responsibility for mandatory smallpox vaccinations reflects his first professional dealings in the topic of microbiology.

Bacteriological Studies with Robert Koch

Bacteriology initially interested Walther mainly because of its possible contribution to his environmental studies. In 1881 and 1882 he left his post as county physician to spend a sabbatical in Robert Koch's Kaiserliches Gesundheitsamt (Imperial Health Agency). There Walther conducted elaborate experiments on the microbial contamination of air, completing a long report in which he demonstrated his dedication to detailed work and patience. This research experience also broadened his abilities in environmental hygiene, and he continued to contribute to the developing med-

ical field of hygiene, using the newly acquired skills in bacteriology.

To the studies of air quality, Walther added bacteriological examinations of drinking water, swimming pools, and treated wastewater. He made major contributions to the methods for quantitative bacteriological water testing. As his knowledge in the new field of bacteriology increased, he studied bacterial metabolism and described several technical innovations, among others an anaerobe culture technique. Outbreaks of communicable diseases, such as diphtheria, typhoid, bacillary dysentery, and cholera, in the Dresden area challenged him as a public health physician and bacteriologist to study the diseases in his laboratory. His contributions to the laboratory diagnosis of tuberculosis were recognized nationally (e.g., by Lydia Rabinowitsch) and internationally (by Theobald Smith) and were based on a new culture medium he had developed.

Walther Hesse

Lina Hesse as Technician and Illustrator

Walther's wife, called Lina in the family, was his major supporter in many different projects. Aside from her duties in the house and in the education of three sons, she became well acquainted with Walther's scientific work and assisted him like a present-day medical technologist. The profession was not then known. However, this period ushered in many changes for women in Germany, and they were just starting to step out of the domestic environment into professional life.

Working with her husband, Lina soon played a major part in the magnificent development of medical illustration. She was not the only talented artist of the family. Her grandfather was the Swiss painter Leopold Robert, and her younger brother, Louis Eilshemius, achieved some fame as a New York painter. She used her talent to prepare drawings of microscopic preparations for her husband's publications. The last publication of Walther Hesse from 1908 described a quantitative method for the culture of intestinal bacteria with special attention to stools from typhoid fever patients. Lina drew pictures of the magnified colonies on agar plates during different growth phases and colored them with watercolors in a highly accurate way, indicating her thorough understanding of bacteriology and microscopy. (The author is proud to possess his grandmother's original drawings.)

The Introduction of Agar-Agar

Walther had major technical problems attempting to analyze microbial counts in air. In the summertime, both Schwarzenberg and Dresden had temperatures that caused liquefaction of gelatin, the solid culture medium used to coat glass tubes used for the studies. Furthermore, gelatin-liquefying bacteria often destroyed the cultures. One day the frustrated scientist asked Lina why her jellies and puddings stayed solid at these temperatures. She told him about agar-agar.

Agar-agar had been known as a gelling agent in warm climates. For example, East Indian swallows use agar for making their nests—the bird's nests of the famous Chinese soup. Lina had learned about this material as a youngster in New York from a Dutch neighbor who had immigrated from Java. The practical application of this kitchen secret was to bring major recognition to the Hesses, more today than during their lifetime. It contributed to Walther's success with his air studies, and it was an essential contribution to the development of modern bacteriology. The thermal stability of agar, its resistance to microbial enzymes, and the ability to sterilize the medium and store it for a long time permitted long-term cultures, especially important in tuberculosis research and diagnosis.

Walther reported this finding to Robert Koch, who immediately included the new medium in his studies of the tubercle bacillus. Although Koch mentioned agar-agar in a short sentence in his 1882 preliminary note on the tubercle bacillus, he did so without giving credit to the source. Walther soon developed a tuberculosis nutrient agar with the firm of Heyden, Radebeul, that permitted him to observe growth on solid agar plates as soon as 2 to 3 days after inoculation.

In the Hesse family, this contribution to bacteriology was hardly ever mentioned. Lina never spoke about it, probably because she was a very unassuming person. She kept all of Walther's papers and documents out of love and respect for her husband and as part of her own contributions to his work. The Hesses never received any financial rewards for their "invention," nor did they ever consider exploiting the matter commercially. It would not have been "proper."

Walther Hesse and Public Health

In 1899 Walther went on a tour of northern Germany, England, and the United States to study public health installations. In Hamburg and Bremen he visited the waterworks and industrial and municipal sewage treatment plants and discussed special questions of domestic and industrial wastewaters. On 2 September he departed by ship to New York, where he visited several bacteriological institutes in the Parker Hospital and in the laboratories of the College of Physicians and Surgeons. He also inspected the new

water reservoir behind the Croton dam along with the aqueducts, comparing the project with the construction of the pyramids or the Tower of Babel. He was similarly impressed by the water filtration system of Lawrence, Mass. In Waltham, Mass., near Boston, he met the physician Alfred Worcester, whose establishment of a school for nurses and introduction of Pfund's infant formula he particularly praised. He liked the city of Philadelphia, Pa., and its Fairmont Park, and in Washington, D.C., "one of the most beautiful cities I have seen," he saw a small military hospital and the new experimental drinking water station with its gigantic reservoir. He commented on the tremendous water usage in the United States! In U.S. and English cities he reviewed the incidence and therapy of tuberculosis, typhoid, and diphtheria; looked at school systems; and inquired about dairy cattle, the milk supply, and sewage treatment.

Walther was always very interested in the hygienic aspects of milk, mainly for controlling infant mortality. After the mothers had been saved by Semmelweis, it was time to look at the survival of their offspring and their nutritional development. The major problem was milk-borne intestinal infections. In 1900 Walther saw a publication by Theobald Smith from Boston concerning the pasteurization of milk and the possible control of tuberculosis and other infectious diseases. Upon Smith's request Walther experimentally confirmed his findings and became one of the prime advocates of milk pasteurization in Germany. He convinced the Dresden dairy of Pfund Bros. to pasteurize their entire daily milk volume of about 15,000 liters by heating for 20 minutes at 60°C. This collaboration with the Pfund dairy, a company with many stores in the city of Dresden, brought Walther's grandchildren, even after his death, some advantage. During the time of starvation at the end of the first world war, they were provided with the rare commodity of milk in memory of the great services and efforts of their grandfather.

In 1890 Walther moved to Dresden as the Bezirksarzt for the county around the city of Dresden. He purchased a house in Strehlen, a suburb of Dresden, where he lived until his death in 1911. Until he was given a laboratory building by the Chemistry Department of the Technical University, he worked at home, and many of his publications were written in this house. He was honored by the government by being appointed Geheimer Medizinalrat (privy medical councilor). After his death, the laboratory at the university was burned because the virulent bacterial cultures, including plague bacilli, were "a danger to public health." Walther left a large collection of minerals, collected during his many visits to mines. The author inherited the collection and donated it later to his high school.

Frau Hesse in Dresden

Lina survived her husband by 23 years. At first she stayed in the house in Strehlen, but in 1917 she sold it and moved into town to be closer to her children. Her American heritage was evident; she never lost her American accent, counted in English, and often used English expressions and commands. When her family home in New Jersey was sold, her part of the inheritance was kept as enemy property during World War I, and only many years later did she receive small sums of money that helped to enhance her small pension as the widow of a civil servant. She died on 1 December 1934. Since Dresden was completely destroyed by Allied air raids in early 1945, many of the mementos of the Hesse family were lost. However, letters, documents, and personal memories were collected from members of the family and added to my collection of Walther's personal reprints held by my grandmother. All that plus my personal memories assisted greatly in the preparation of this review of Walther and Lina Hesse's contributions to public health and microbiology. □

Translator's Acknowledgment

I am grateful to Wolfgang Hesse for allowing me to translate and edit this brief biography of his grandparents. A full and verified list of Walther's publications is available. Thanks are due to the staff of the University of Virginia Claude Moore Health Sciences Library, especially Joan Echtenkamp Klein.

Suggested Reading

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